Data Manipulation

Machine Instruction Categories

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Machine Instruction Categories

Machine Instruction

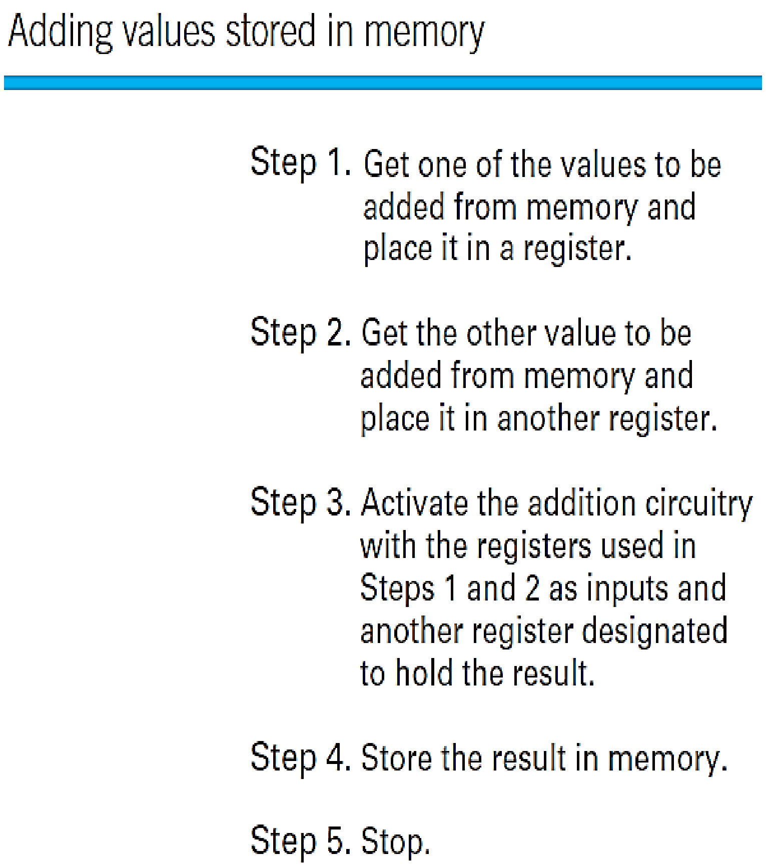
- ✓ Whatever architecture is used: CISC or RISC, machine instructions can be categorized into three broad classes.

Machine Instruction Categories

Classes:

- ✓Data Transfer group
- ✓Arithmetic/Logic group
- ✓Control group

Machine Instruction Categories



Adding values stored in memory

Step 1. Get one of the values to be added from memory and place it in a register.

Step 2. Get the other value to be added from memory and place it in another register.

Step 3. Activate the addition circuitry with the registers used in Steps 1 and 2 as inputs and another register designated to hold the result.

Step 4. Store the result in memory.

Step 5. Stop.

Data Transfer Group:

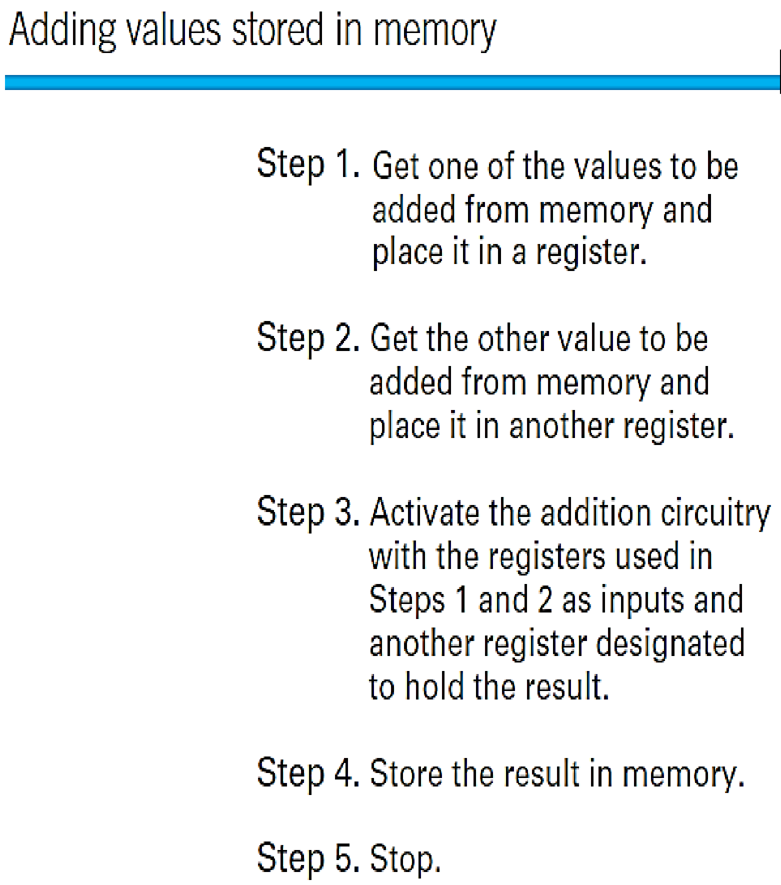
- ✓ Deals with transfer of data.
- ✓ Step 1, 2, 4.
- ✓ Transfer is not moving, its copying rather.
- ✓ Special terms are used when talking about transfer between CPU and

Machine Instruction Categories

Data Transfer Group:

- ✓LOAD: retrieving data from memory and filling the general purpose register.
- ✓STORE: Register to memory
- ✓I/O instructions: instructions for external devices (Printer, Scanner, Keyboard)

Machine Instruction Categories



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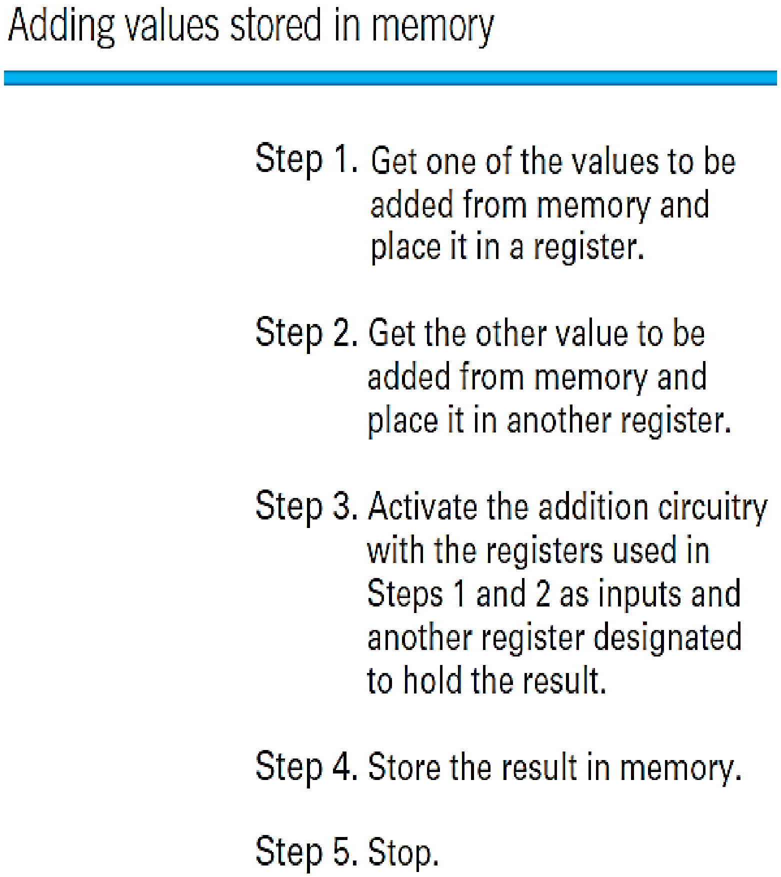
Arithmetic/Logic roup:

- ✓ Request an activity within ALU.
- ✓ Step 3
- ✓ Boolean operations like AND, OR, XOR
- ✓ SHIFT. ROTATE,

Machine Instruction Categories



Adding values stored in memory

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Step 3. Activate the addition circuitry with the registers used in Steps 1 and 2 as inputs and another register designated to hold the result.

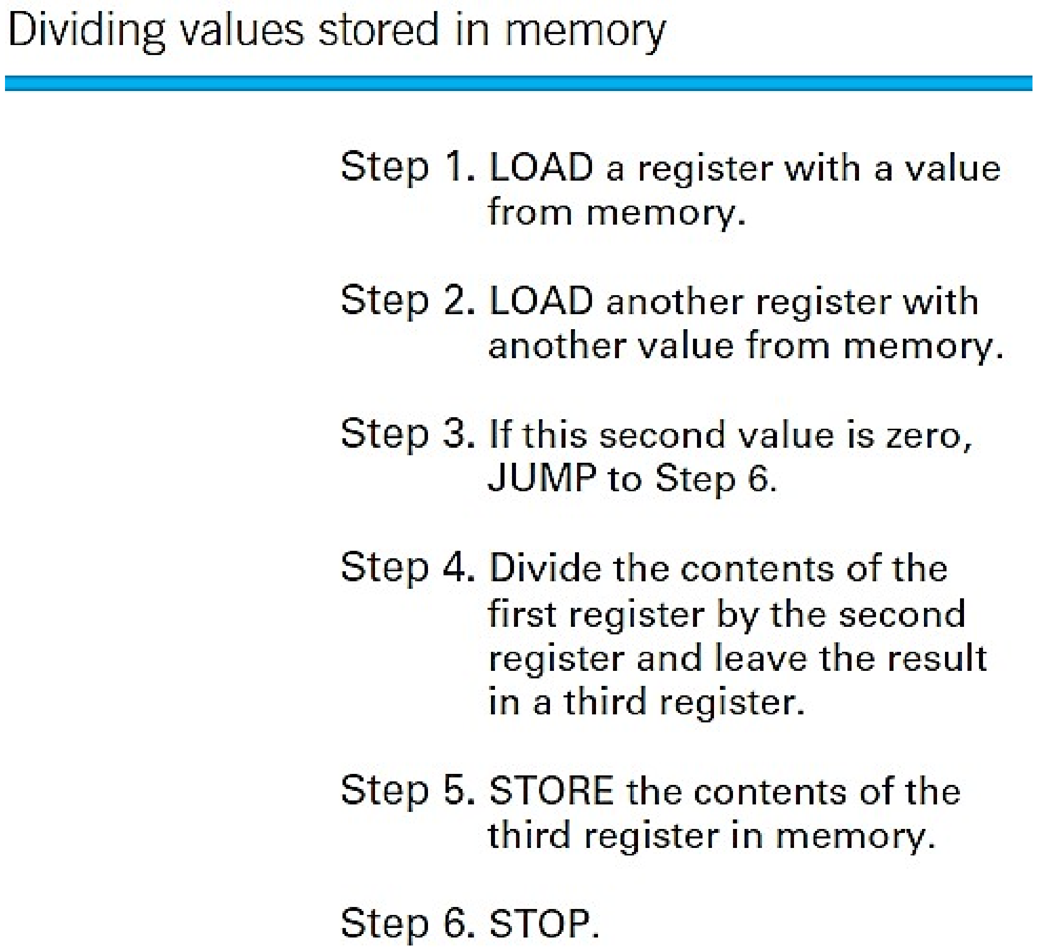
Step 4. Store the result in memory.

Step 5. Stop.

Control Group:

- ✓ Execution rather than manipulation
- ✓ Step 5.
- ✓ Many other instructions like JUMP (BRANCH),
- ✓ Unconditioned Jump

Example



Dividing values stored in memory

Step 1. LOAD a register with a value from memory.

Step 2. LOAD another register with another value from memory.

Step 3. If this second value is zero, JUMP to Step 6.

Step 4. Divide the contents of the first register by the second register and leave the result in a third register.

Step 5. STORE the contents of the third register in memory.

Step 6. STOP.

Summary

Machine Instructions categories

- ✓ Data Transfer group
- ✓ Arithmetic/Logic
- ✓ Control
- ✓ Examples and scenarios